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A NEW SPECIES OF *PROTOSPHINDUS* (COLEOPTERA: SPHINDIDAE) FROM CHILE WITH NOTES AND DESCRIPTIONS OF IMMATURE STAGES OF RELATED FORMS

INTRODUCTION

The genus *Protosphindus* was briefly described by Sen Gupta and Crowson (1979) for a single Chilean species - *P. chilensis*, and placed in the monogeneric subfamily Protosphindinae. The genus is distinguished from the remaining sphindids by the following adult features: (1) body comparatively elongate, parallelsided and slightly depressed; elytra with alternate intervals raised to form of carinae; (2) antenna 11-segmented with 3-segmented club; (3) antennal insertions partly covered by raised frontal sides; (4) pronotal sides dentate laterally; (5) prosternal sutures well marked, almost parallel; (6) last labial palpomere ovoid and slightly inflated; (7) meso-metasternal junction with double knob; (8) abdominal ventrites with lateral pockets.

Most of the above listed characters are probably generalized for the family, and they suggest *Protosphindus*, to be the most primitive member to the family with a relict distribution. The family, especially *Protosphindus*, is closely related to the Protocucujidae (*Ericmodes* Reitter) that also occur in Chile, but *Ericmodes* can easily be separated from *Protosphindus* by its lobed 3rd tarsomere, the mandibles without dorsal tubercles and cavities and the frontoclypeal groove weak or absent.

The larvae of *Sphindus dubius*, *Aspidiphorus orbiculatus* and *A. lareynei* from Europe were described by Perris (1855, 1877) and Peyerimhoff (1922), but their descriptions were rather inadequate for phylogenetic purposes. Much more complete descriptions of the *Sphindus americanus* and *Odontosphindus clavicornis* were provided for the

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American species by Boving and Craighead (1931) and Sen Gupta and Crownson (1979), respectively. We have recently studied larvae of *Sphindus dubius*, *Aspidiphorus orbiculatus*, *Odontosphindus clavicornis* and *Protosphindus chilensis*, as well as pupae of *A. orbiculatus*. This paper includes larval and pupal descriptions, a new key to the larval forms of the family Sphindidae, a redescription of the genus *Protosphindus* with description of a new species, and short notes on biology of the European species.

Protosphindus Sen Gupta and Crowson

Protosphindus Sen Gupta and Crowson, 1979: 181. Type species, by original designation: *P. chilensis* Sen Gupta and Crowson.

D e s c r i p t i o n (Figs. 1-17) – Body slightly elongate, moderately depressed, shiny, almost glabrous.

Head transverse with large, prominent and finely faceted eyes (figs. 1,2); fronctoclypeal suture arcuate, deeply grooved. Vertex with prominent admedian tubercles. Antenna 11-segmented (fig. 3), scape stout, inflated on anterior side, pedicel asymmetrical, last three segments form distinct and dull, pubescent club. Labrum transverse (fig. 10) densely setose on anterior margin with heavily sclerotized, transverse, raised slat on dorsal side and posteriorly directed tubercle on ventral side; labral rods short, lightly sclerotized. Maxilla (fig. 9) with slender galea and lacinia with two non-articulated spines at outer margin just before middle, both densely hairy; palpi 4-segmented, last palpomere longest and narrowing apically. Mandible (fig. 8) bidentate apically with short, fringed prostheca and well developed mola; dorsal tubercle and cavity well developed. Labium with trapezoidal mentum, prementum widened anteriorly and ligula expanded apically, setose (fig. 7); palpi 3-segmented with apical palpomere ovoid and inflated. Gular sutures indistinct. Tentorial arms (fig. 2) widely separated anteriorly, joined at base by a simple corpotentorium. Antennal grooves on ventral side of head large and well defined.

Prothorax transverse with lateral sides narrowly explanate and the edges with lateral teeth (figs. 1,4); pronotal disc with four carinae and subcontiguous punctation; prosternal sutures entirely visible. Procoxal cavities widely closed posteriorly, almost open internally. Prosternal process strongly widened apically (fig. 4); protrochantins fully exposed.

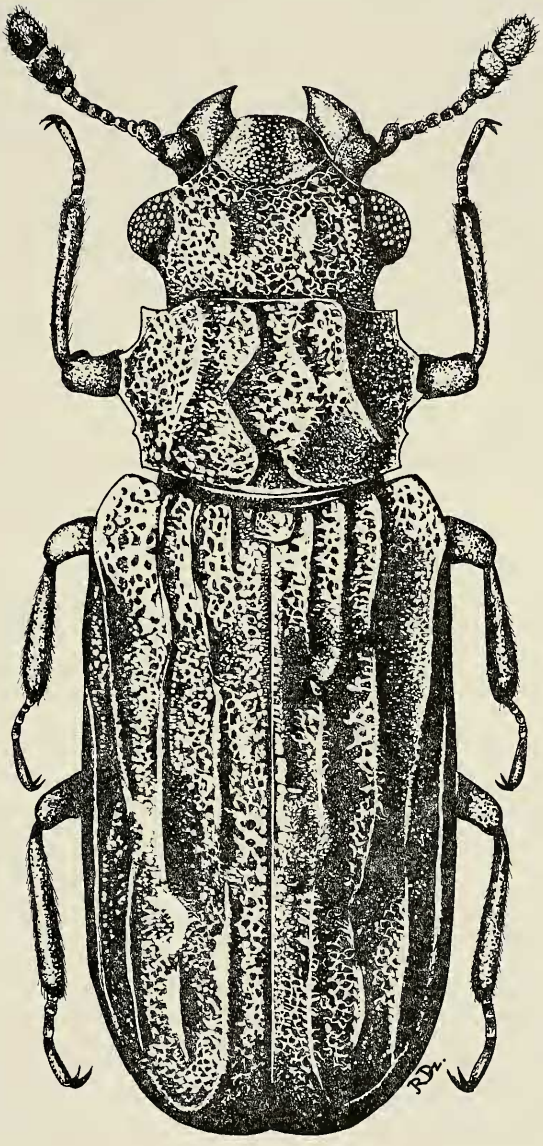
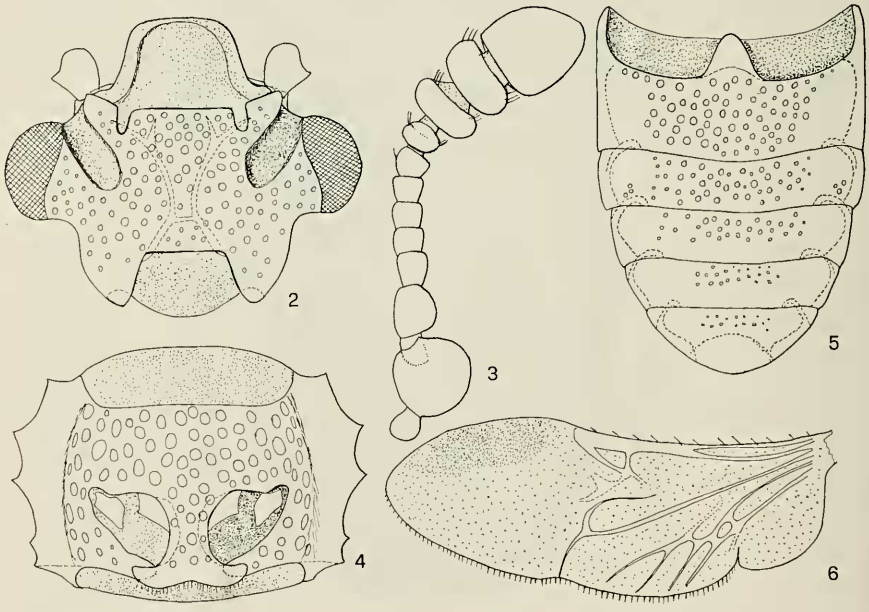


Fig. 1 - *Protosphindus chilensis*, male.

Pterothorax (fig. 12). Mesocoxae with exposed trochantin, their cavities widely open outwardly; meso-metasternal junction with double knob as in fig. 12; metasternum large with median impressed line at basal 2/3. Metacoxae transverse. Metendosternite (fig. 11) with broad stalk and widely separated arms, devoid of anterior tendons. Elytral epipleura narrow but complete. Elytral disk with interrupted costae on 3rd, 5th, 7th and 9th intervals. Wing (fig. 6) with 5 anal veins, radial and anal cells and r-m cross vein; jugal lobe present.

Abdomen (fig. 5) with intercoxal process narrow and rounded apically; ventrite I slightly longer than II, ventrites II-V with lateral pockets. Aedeagus with ventral tegmen (fig. 14), which consists of narrow basal piece and non-articulated, fused parameres (fig. 15); median lobe (fig. 16) with rich internal ornamentation apically, almost as long as tegmen.

Legs with slightly oblique trochanters, femora swollen in middle and almost parallel-sided tibiae, protibia with two apical spurs (fig. 13).



Figs. 2-6 - *Protosphindus chilensis*, male: 2 - head, ventral, mouths-parts removed; 3 - antenna; 4 - prothorax, ventral, coxae removed; 5 - abdomen, ventral; 6 - wing.

Tarsi 5-5-5 in female and 5-5-4 in male, tarsomeres simple, claws simple, empodium present.

Distribution – It is known only from Chile.

Biology – According to Lawrence and Newton (1980) adults of *P. chilensis* were collected in Chile from small, yellowish slime mold fruiting bodies. The presumed larvae of the same species were found in *Stemonitis* sp. fruit bodies. Most of adults of both species were found under *Nothofagus* bark and in rotten wood and leaf litter.

Key to the adults of *Protosphindus*

1. Elytral costae elevated apically (fig. 17), those of 3rd and 7th intervals not joined apically. Elytra only 2.35 x as long as pronotum ..... *P. bellus* sp. n.
– Elytral costae not elevated apically (fig. 1), those of 3rd and 7th intervals clearly joined. Elytra 3.5-4.0 x as long as pronotum ..... *P. chilensis* Sen Gupta and Crowson

Protosphindus chilensis Sen Gupta and Crowson (Figs. 1-16)

Protosphindus chilensis Sen Gupta and Crowson, 1979: 182. Type locality « Chile » - As ? *Plagiope* Er.: Crowson 1955: 102, fig. 117.

Adult – Colour variable from uniformly reddish-brown with fuscous antennal club to piceous-black with reddish-brown legs, antennae except club, and reddish marks on elytra. In darker specimens head and pronotum markedly darker than elytral bases with metallic shine; elytra moderately shiny.

Head transverse, coarsely punctured, punctures separated by less than 0.5 diameter and 2-2.5 x larger than facets of eye. Clypeus concave with somewhat raised sides and anterior margin, finer than frons punctured. Vertical tubercles distinct, but not sharply raised, supraocular ones almost absent. Punctures mostly with fine, yellowish, recumbent setae.

Pronotum transverse (0.63-0.69 x 0.93-1.16 mm) with punctures as large or slightly larger than those of vertex; disk with admedian carinae in median part almost obsolete, sublateral ones in anterior half very strongly carinate than behind this point bent to posterior angles and gradually less prominent. Scutellum transverse, setose.

Elytra 1.7-1.85 x as long as wide and 3.5-4.0 x as long as pronotum; scutellary striole present, bordered by a short carina. Elytral disk with costae on 3rd, 5th, 7th and 8th intervals as in fig. 1; strial punctures as large as those of pronotum, subcontiguous, setigerous, but setae strongly appressed and slightly visible. Sutural interval convex. Each elytron with four well visible depressions between costae.

Aedeagus as on figs. 14-16.

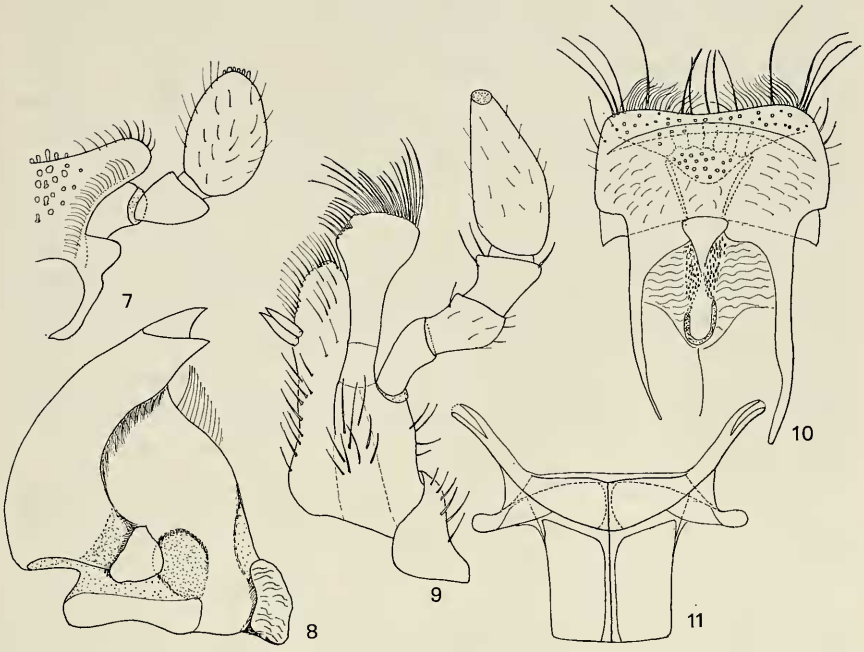
Length 3.19-4.13 mm.

Material examined: Chile: no more detailed data, coll. Philippi (MS, IZPAN); Llanguihue, Prov. Lago Chapo, 13.5 km E. Correntoso, 310 m, 16-27.XII.1982, Site 656, Valdivian R.F. (A. Newton, M. Thayer); Cautin Prov., Bellavista, n. shore Lago Villarrica, 310 m, 15-30.XII.1982, site 655, same plant community and collectors; same prov., Volcan Villarica, 1250 m, 15-29.XII.1982, site 653 *Nothofagus dombeyi*, *N. pumilio*, *Chusquea*, same colls; Conception Prov., c. 6 km S. San Pedro, 360 m, 12.XII-2.I.1983, site 684, *Pinus* sp. forest, same colls; Nuble Prov., 22.7 km ESE Recinto, 1330 m, 10.XII.82-3.I.1983, site 646, *Nothofagus* forest, same colls; Valdivia Prov., 4.1 km Anticura, 270 m, 19-25.XII.1982, Valdivian R.F., site 663, same colls; Osorno Province, Park Nat. Puyehac, 4.1 km E. Anticura, 430 m, site 662, 19-26.XII.1982, same plant community and colls; same but 7.7 km NE Termas de Puyehac, 200 m, site 664; Malleco Prov., 6.5 km E. Malalcahuello, 1080 m, s. 651, 12-31.XII.1982, same colls; same 12-14 km E. Malalcahuello, 1350-1370 m, s. 649, 650, same colls - all the above specimens were collected at « window traps ». Nuble Prov. 22.7 km ESE Recinto, 1330 m, same coll. pyrethrin fogging *Nothofagus* bark; Malleco Prov. 4 km W. Victoria, 300 m, 26-31.XII.1976, (S. Peck). Total 102 specimens examined (ANIC, IZPAN, MSNG, MS).

Presumed larva of **P. chilensis** Sen Gupta and Crowson (figs. 18-31)

Length 3.5-4.2 mm. Body elongate, subcylindrical and slightly flattened, tapering feebly anteriorly and posteriorly, constricted between segments that are broader than long. Colour yellowish-white with brownish spots on dorsal surfaces. Body lightly sclerotized except for mandibles and urogomphi which are brown and firmly sclerotized.

Head (figs. 18-22) slightly wider than long, about 0.7 mm wide, flattened dorsally, sides rounded; head capsule about 0.8 x as wide as prothorax; colour brownish above and paler beneath. Occipital foramen



Figs. 7-11. *Protosphundus chilensis*, male: 7 - labium (part), dorsal; 8 - left mandible, dorsal; 9 - right maxilla, dorsal; 10 - labrum-epipharynx, dorsal; 11 - metendosternite.

large and nearly circular. Frontal sutures translucent, well visible in posterior parts of frons, anterior parts of frons being fused with epicranium and epistoma. Frons lyre-shaped, with 5 setae and few pores on each side. Epicranial suture short and wide, about 0.1 x as long as frons. Epicranial plates large with 6 setae dorsally and 8 setae laterally on each side.

Clypeus fused with epistoma but articulated with labrum, bearing one row of 6 setae and two pores dorsally. Labrum (fig. 21) subtrapezoidal, rounded anteriorly with 8 setae near anterior margin, and one pair and four pores close to hind margin. Epipharynx (fig. 22) membranous: anterior margin with 4 curved setae on each side, two pointed ones medially; median part with 6 placoid sensillae and several minute ones arranged in transverse row; lateral parts with short, conical spinulae directed obliquely; posteriorly surface of epipharynx with longer setae and numerous transverse ridges.

Mandibles (figs. 23-25). Right and left ones similar, tridentate apically, the middle tooth being the longest; on inner margin ventrally, prominent, oval mola, transversely marked by 9-10 distinct striae on inner ventral surface; prostheca situated in excavated space between mola and apex, translucent, thin and spiniform; ventral crushing tubercle on ventral surface near mola base well developed with adductor muscule attachement.

Antenna (fig. 26) short, situated on wide circular basal process within which is partly retracted; antennomere I broader than long with 2 pores; II longest, cylindrical, about 1.6 x longer than preceding one, with single sensory pore and 3 small trichoid sensillae apically; antennomere III about 3 x as long as wide with long seta and 3 trichoid sensillae apically; accessory segment about 0.5 x as long as antennomere III, conical and situated at ventral extremity of the antennomere II.

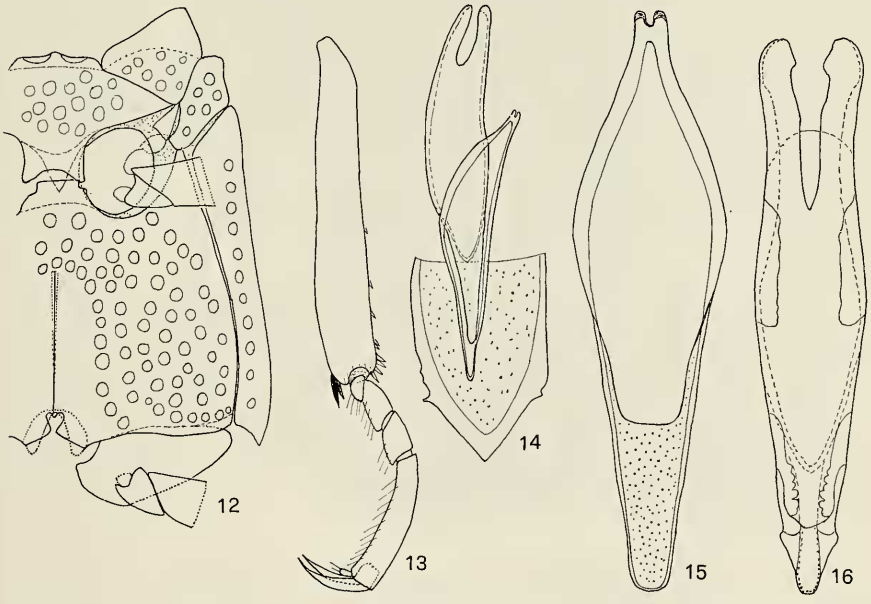
6 ocelli on each side, but only 5 darkly pigmented; 4 form a square just posterior to antenna, the 5th ocellus more ventral, and the 6th lacking pigment, minute, hardly noticeable posterior to fifth one.

Maxilla (figs. 28-29) with short subtriangular cardo; stipes narrow with 4 setae at outer margin. Mala broad and rounded anteriorly with a number of short, stout setae anteriorly and with a row of 5-6 setae dorsally on inner margin. Palpi 3-segmented: palpomere I with 2 pores, II with minute seta and single pore, the terminal one with single digitiform peg in a groove on dorsal face, and single pore and a group of minute papillae apically (fig. 30). Articulating area swollen, fleshy lobe nearly oval, extending to the concave lateral margin of the labium.

Labium (fig. 20) free as far as prementum base. Prementum broader than long, separated from mentum by a transverse suture with 2 setae and 6 pores. Mentum and submentum hardly distinguishable: mentum transverse with 2 setae medially and 4 pores near posterior margin; submentum with 2 long setae. Ligula blunt and rounded with 2 straight setae. Palpi 2-segmented: basal palpomere with single pore, apical one slender with single pore, finger-shaped sensory appendage and minute papillae apically. Hypopharynx (fig. 27) well developed, consisting of transverse skeletal bar at base of mentum which is attached on either side to base of corresponding mandible by a strong filament, two suspensory apodemes extending backwardly into head capsule and membraneous area behind the bar covered with fine, short setae. Anterior margin of hypopharyngeal bridge with 2 anterior horns extending

anteriorly, each with a tuft of inwardly directed hairs. Between the horns there is a tuft of hairs and more laterally hairy, flange-like superlingue arising from the bar on each side. Lingua fleshy, minute, posteriorly four gustatory sensillae.

Thorax (fig. 18) about 0.25 of total length. Prothorax 0.5 x as long as wide, considerably longer than other terga; surface with three transverse rows of short and longer setae on each side near margins; brown tergal plate, interrupted medially by pale suture, wider than in other terga. Mesothorax about 0.33 x as long as broad with mesonotum bearing a few irregular spots, 2 transverse rows of long, fine setae and 3 long setae on each side near margin. Mesothoracic spiracle markedly larger than abdominal ones. Terga of thorax and abdomen faintly granulate, when viewed under 80 x magnification; anterior and posterior margins of each tergite smooth. Prothoracic pleural sclerites lacking. Meso and metathoracic parascutal area (alar area) with 6-7 setae. Thoracic sterna weakly sclerotized, pale, without setae.



Figs. 12-16. *Protosphindus chilensis*, male: 12 - pterothorax, ventral; 13 - hind tibia and tarsus; 14 - 8th tergite and aedeagus, ventral; 15 - tegmen, ventral; 16 - median lobe, ventral.

Abdomen with segments I-VIII similar in shape; tergites of those segments each with a few irregular brownish spots. Each tergum with two transverse rows of long and short setae and four long setae along each lateral margin. Epipleural area protuberant, each with single long seta and 6-8 fine ones. Hypopleura consisting of two swollen areas, the dorsal with single long seta and 5-7 minute ones, and the ventral one with one long and 2-3 short setae respectively. Sterna each with 2 long and 4-6 short fine setae, weakly sclerotized, pale. IX segment subtrapezoidal, at base about 1.5 x as wide as long; pleural sclerites fused with tergite and sternite; dorsal surface with a few brownish patches and oblique row of setae medially and a few longer setae along lateral margins; ventral side with transverse row of 8-10 setae. Urogomphi brown, slightly upturned, pointed and with minute setiferous tubercles, widely separated by wide semicircular space (fig. 18). Anal tube with 2 papillate lobes situated side by side.

Spiracles very small, annular and surrounded by a sclerotized ring; situated laterally on mesothorax and abdominal tergites I-VIII.

Legs (fig. 31) relatively long, moderately widely separated, all of similar shape. Coxae broadest and longest, excavated at outer surface with a number of short and longer setae. Trochanter short, subtriangular with 6 setae and 5 pores: Femur obliquely attached to trochanter with 4 setae dorsally and 5 ventrally. Tibiotarsus slightly tapered apically with 6 setae medially and 2 apically. Ungula short, curved with 2 unequal setae near base.

Gut contents includes numerous dark pigmented Mycetozoan spores.

M a t e r i a l e x a m i n e d : 9 mature larvae collected with adults of *P. chilensis* from *Stemonitis* sp., Chile: Valdivia Prov., 4.1 km W. Anticura, 270 m, 19-25.XII.1982 (A. Newton et M. Thayer) (IZPAN).

Larva of *P. chilensis* can be distinguished from all known larvae of Sphindidae in having mandible tridentate apically, dorsal surface with dark pigmented spots and long setae, and the abdominal segment IX with moderately long, pointed urogomphi.

Protosphindus b e l l u s sp. n. (Fig. 17)

Dorsal surface brown to dark-brown with darker antennal club and yellowish spots on elytra; surface moderately shiny.

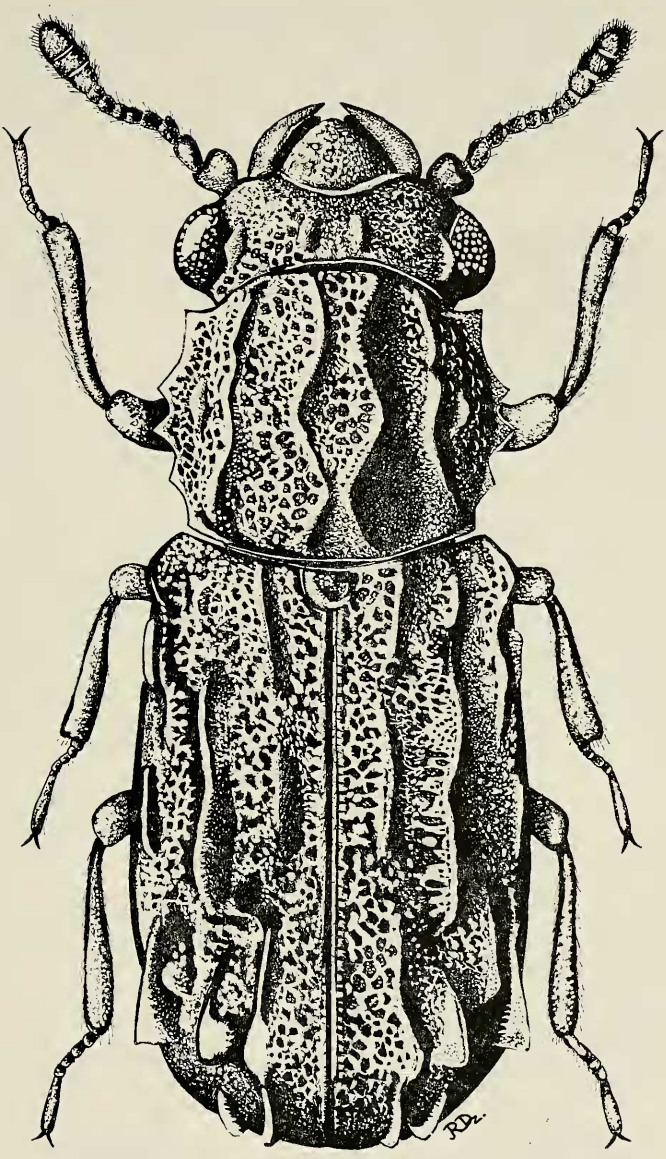
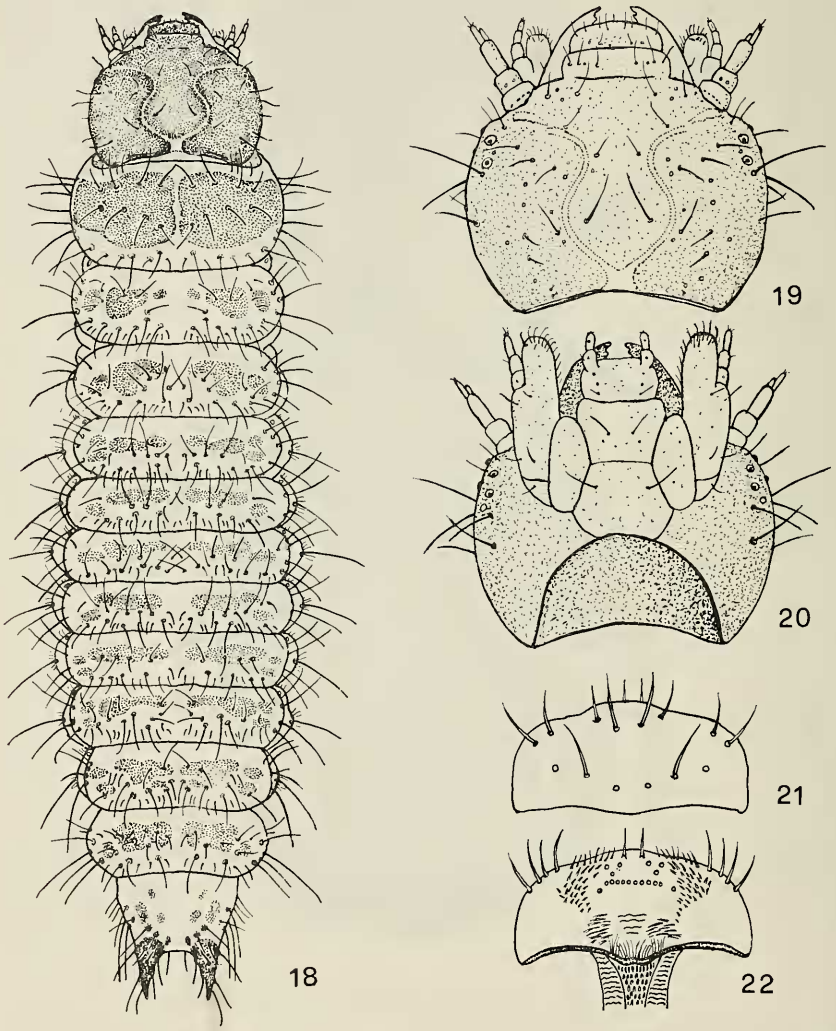


Fig. 17 - *Protosphindus bellus* sp. n., female.

Head transverse (0.45 x 0.80), coarsely punctured, punctures setigerous, subcontiguous and 3-4 x as large as eye facets. Clypeus convex, densely punctured, punctures with long setae, their diameter about a half smaller than those of frons. Vertex with four sharp tubercles, admedian and supraocular ones (fig. 17); frons in front of tubercles concave with raised sides near antennal insertions.



Figs. 18-22. *Protosphindus chilensis*, larva: 18 - dorsal view; 19 - head, dorsal; 20 - head, ventral; 21 - labrum, dorsal; 22 - labrum-epipharynx, ventral.

Pronotum 0.73 x as long as wide, widest slightly before middle; surface convex with four sharp carinae, admedian carinae complete and very narrowly separated basally, sublateral ones interrupted at anterior 1/3 and do not reach pronotal base. Behind sublateral carina a raised, short tubercle on each side at middle. Pronotal punctures larger than those of head and almost contiguous. Scutellum slightly transverse and encircled by shallow groove.

Elytra 1.48 x as long as wide and 2.35 x as long as pronotum, slightly widened towards apices; each elytron with sharp costae on 3rd, 5th, 7th and 9th intervals as on fig. 17. Scutellary striole absent.

Length 2.69 mm.

Material examined:

Holotype ♂: Chile, Conception Province, c. 6 km S. San Pedro, 360 m, site 648, 12.XII.82-2.I.1983, *Pinus* sp. forest, window trap (A. Newton et M. Thayer) (ANIC).

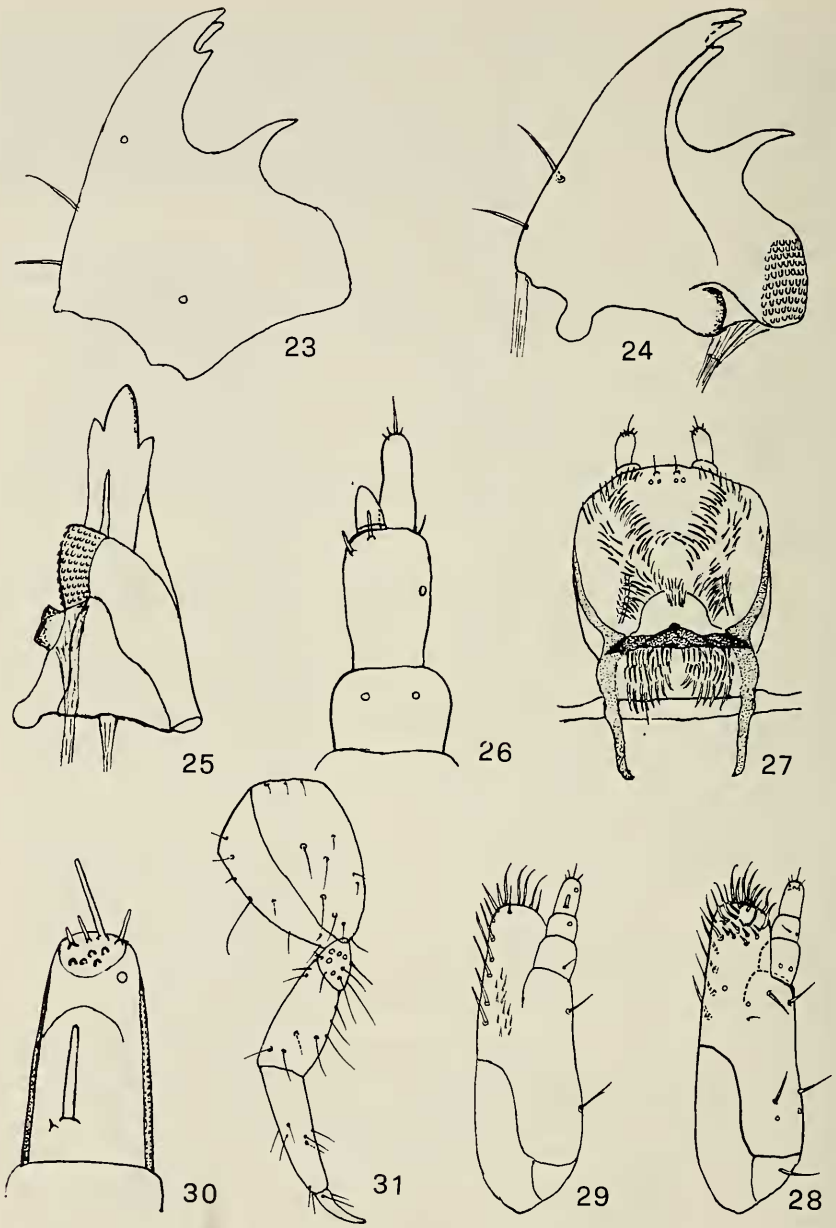
Paratypes - 9 specimens: same data as holotype (ANIC, IZPAN); same province but, 8.4 km W. La Florida, 170 m, 2.I.1983, xerophytic forest, berlesed leaf and log litter, same colls (ANIC); Malleco Prov. Parque Nat. Tolhuaca, 2 km E. Lago Malleco, 925 m, 1.I.1983, berlesed leaf and log litter, same colls (IZPAN); « Chile ex coll Philippi, ex coll Mus. Stettin » (IZPAN, MSNG).

Notes on the immature stages of related genera

Larva of **Odontosphindus clavicornis** Casey (figs. 42-44)

Description – Sen Gupta and Crowson, 1979: 187.

Diagnosis – Larva of this species and that of *Protosphindus chilensis* are very similar in having the antennomere II short (fig. 43), no more than 2 x as long as the first one and the abdominal tergite 9 with pointed, slightly upturned urogomphi. From larvae of *P. chilensis* those of *O. clavicornis* can be distinguished by their mandibles unidentate apically (figs. 42, 44), the ventral crushing tubercle less developed, the sensory appendage and antennomere III situated side by side on the apical part of antennomere II, the dorsal surface with smaller and lighter spots and much shorter setae.



Figs. 23-31. *Protosphindus chilensis*, larva: 23 - left mandible, dorsal; 24 - right mandible, ventral; 25 - right mandible, inner view; 26 - left antenna, ventral; 27 - hypopharynx, dorsal; 28 - left maxilla, ventral; 29 - right maxilla, dorsal; 30 - maxillary palpomere III; 31 - right mesothoracic leg, anterior aspect.

According to our observations, all sphindid larvae have well developed ventral crushing tubercle and only single digitiform peg on dorsal surface of palpomere III, instead of two pegs and no crushing tubercle as noted by SEN GUPTA and CROWSON (1979, fig. 18).

Material examined: single mature larva collected from *Fuligo septica*, USA, Greenfield, New Hampshire, Hillsborough County, lot 3462, coll. and named by J.F. Lawrence (IZPAN).

Larva of **Sphindus dubius** (Gyllenhal) (figs. 38-40)

Description: PERRIS, 1855; PEYERIMHOFF, 1922.

Diagnosis – Length 1.9-1.2 mm, head width 0.4-0.23 mm. The larva is well characterized by its thorax and abdomen with dark, gray spots on terga; abdominal tergite IX without urogomphi (fig. 38); antennomere II about 3 x longer than I (fig. 39) and the mandible bearing several preapical teeth and a preapical prominence (fig. 40).

Material examined: 1 mature and 2 younger larvae collected from *Fuligo* sp. fruit body, Poland, Kampinos Forest, Lomna experimental Station, 6.VIII.1986, collected and reared in laboratory by S.A. Ślipinski, determined by association with reared adults (IZPAN).

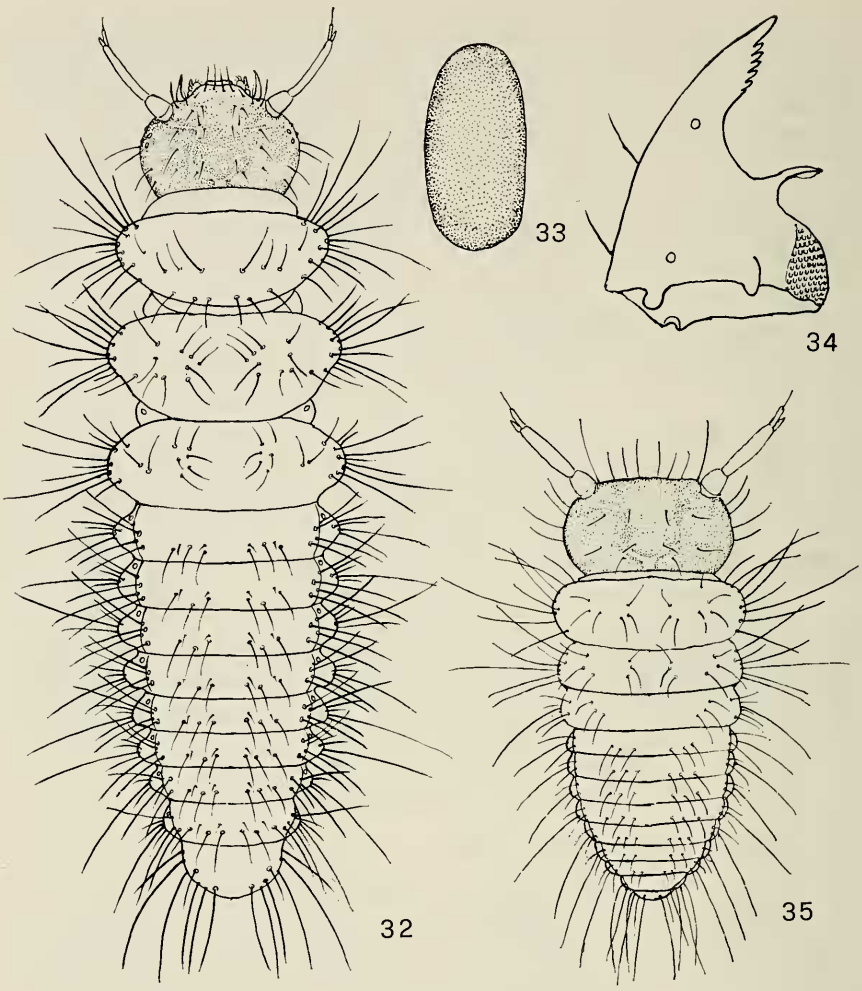
Larva of **Aspidiphorus orbiculatus** (Gyllenhal) (figs. 32-35)

Description: PEYERIMHOFF, 1922.

Diagnosis – The larva of this genus is distinguished from all other known larvae of Sphindidae by its very long antennomere II, which is about 4 x as long as I (fig. 41), the mandible with 5-6 subapical teeth (fig. 34), the pronotum transverse, apparently wider than the next segment, with very long setae, and by its whitish dorsal surface devoid of darker spots.

Description of the first stage larva (fig. 35).

Length about 0.8 mm when first hatched, maximum width 0.32 mm, head width 0.3 mm; coefficient of cephalic capsule width to body length = 2.5. Pronotum about 2.3 x wider than long. It differs from mature larva in having proportionally thicker antennomere II, longer thorax, conspicuously longer thoracic and abdominal lateral setae and tarsal claw with single seta.



Figs. 32-35. *Aspidiphorus orbiculatus*. 32 - mature larva; 33 - ovum; 34 - right mandible, ventral; 35 - first stage larva.

Pupa of **Aspidiphorus orbiculatus** (Gyllenhal) (figs. 36-37)

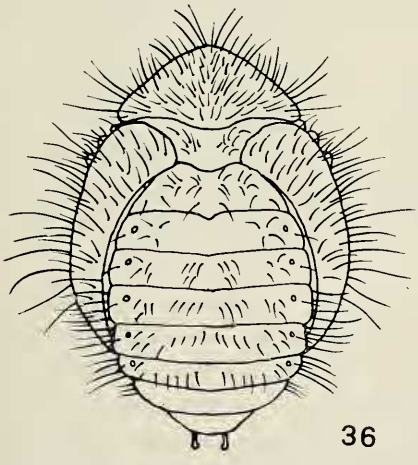
Length 1.5 mm, width across 2nd abdominal segment (including elytra) 0.6 mm; body about 1.4 x as long as wide. Colour whitish with faintly yellowish tinge; covered with long or short, straight or slightly curved setae.

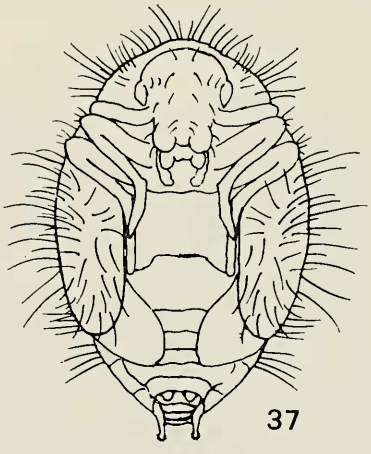
Head convex, inserted into prothorax so that vertex concealed from above; head surface with 8 setae on each side: 2 near inner margin of eye, 1 slightly caudal to eye, 3 form longitudinal row near middle. Clypeus with 2 much finer setae near middle. Mandible with 2 short setae on outer margin. Antenna moderately long, extends outwardly to a point above knee of front leg.

Pronotum subtriangular, broadest at base, almost as long as both meso- and metanotum and about 0.45 x as long as wide; hind angles obtuse; anterior margin rounded. Mesonotum with 6-7 and metanotum with 11 setae on each side. Elytra and wings fitting obliquely at both sides of body and passing to the underside. Elytra with numerous long setae. Wings extending to 4th abdominal sternum.

Legs long, widely separated, anterior and middle legs visible, the metalegs entirely covered by wing, each femora with 3 short setae apically. Distal parts of anterior tarsi extending to middle of metasternal disk, those of middle ones reaching caudal margin of metasternal disk.

Abdomen composed of 9 segments, equaling about 0.4 body length. Tergum I with 4 setae on each side, II-IV each with 4-5 middle and 4 sublateral setae, tergum V with transverse row of 7 setae, remaining terga without setae. Caudal segment with two thin, almost parallel uro-





Figs. 36-37 - *Aspidiphorus orbiculatus*, pupa: 36 - dorsal view; 37 - ventral view.

gomphi clubbed apically and with an additional hook. First five pleurites visible from above. Last larval skin always remains attached to pupa and conceals last three abdominal segments. Pleurites I, II each with short sublateral seta, III-V each with 4 long and one short setae, pleurite VI with 3 short setae, remaining pleurites smooth. Spiracles of abdomen open in pleural membrane near antero-lateral parts of tergites.

The pupa described above is a female as indicated by the two apices of styli posteriorly to the 6th abdominal sternum.

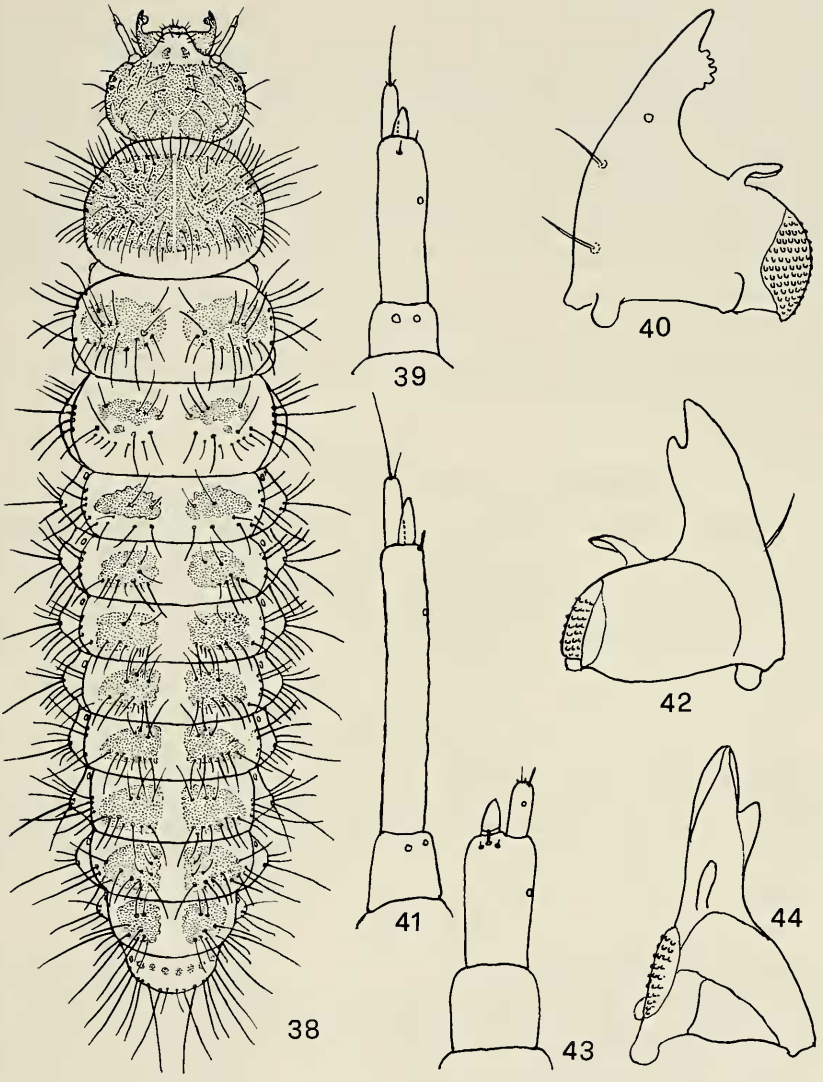
Only the pupa of *A. lareyniei* J. Du Val was briefly described and illustrated by PERRIS (1877). Because of inadequate figures and description we could not find any character to separate pupae of *A. orbiculatus* and *A. lareyniei*.

Larval and pupal material examined: Poland, Kampinos Forest, near Dziekanow Lesny, from slime mold fruit body on birch, 2 mature larvae, 23.VII.1961, B. Burakowski; Warszawa-Powazki, from slime mold fruit bodies, maple-tree, 2 larvae, 1 pupa, 3.VII.1977, B. Burakowski; Beskidy Zachodnie, Mt. Czantoria Wielka, slime mold plasmodium on stump of beech, 25.VI.1962, adults and mature larvae. Brought into laboratory: matting 5.VII; oviposition same date; first instar larva 7.VII; pupae 12.VII; teneral adults 20.VII. all. B. Burakowski (IZPAN); USSR, vicinity of Moskva, myxomycete fruit bodies on pine, 6.VIII.1968, several adults, introduced to laboratory, copulation next day, first instar larvae 13.VIII, all preserved in alcohol, coll. B. Burakowski (IZPAN).

Biology of *A. orbiculatus* (Gyllenhal)

The mature larvae, adults or pupae were introduced to the stoppered glas jars of a half liter capacity or were isolated in a petri dishes, always with fragments of mouldy wood with fruiting bodies and mycelium of slime molds.

The adults apparently ate the spores and supporting structures of the fruiting body. The copulation lasts about 30 minutes. The eggs (fig. 33) are white, smooth and shiny, length 0.5-0.55 mm, maximum width 0.25-0.27 mm, they are laid individually on the surface of the fruit body (peridium) or on mycelium. The female dies soon after egg laying, while the male dies shortly after copulation. The incubation period of eggs lasts about 3 days. The larvae feed on mycelium or extern-



Figs. 38-44. 38-40 - *Sphindus dubius*, larva; 41 - *Aspidiphorus orbiculatus*, larva; 42-44 - *Odontosphindus clavicornis*, larva: 38 - mature larva; 39, 41, 43 - left antenna, ventral; 40 - right mandible, ventral; 42 - left mandible dorsal; 44 - right mandible, inner view.

ally on peridium, often together with larvae of Lathridiidae. Larvae moult four times, the mature larva attaches itself to the substrate by means of an anal secretion. The pupa is anchored in the last larval exuvium, lies on its ventral side and raises its body from time to time to about 30° from surface. Pupal period lasts usually about 9 days. The whole cycle varies from 20-30 days. In the field, adults hibernate under loose bark, in cervices of wood, or in forest-leaf litter. The last specimens on fruit bodies in Poland were found late September, but those did not copulate in laboratory. The species is known from various hosts (Lawrence and Newton, 1980: *Reticularia lycoperdon*, *Fuligo septica* (Linnaeus) and from unidentified slime molds. Some of our specimens apparently come from *F. septica*, but most of our hosts remain undetermined, but apparently include at least 4 different species of slime molds.

Key to the larval types of Sphindidae

1. Abdominal tergite IX with pointed urogomphi (fig. 18); antennomere II no more than 2 x as long as I (fig. 26) 2
– Abdominal tergite IX without urogomphi (figs. 32, 38). Antennomere II about 3-4 x as long as I 3
2. Mandible tridentate apically (figs. 24, 25). Sensory appendage situated ventrally and laterally to antennomere III (fig. 26). Dorsum of thorax with large dark, spots. Dorsal setae relatively long and conspicuous (fig. 18) .... *Protosphindus* Sen Gupta and Crowson
– Mandible bidentate apically (figs. 42, 44). Sensory appendage and antennomere III (fig. 43) situated side by side. Dorsum of thorax with lightly pigmented small spots. Dorsal setae moderately long and inconspicuous ..... *Odontosphindus* Leconte
3. Antennomere II about 3 x as long as antennomere I (fig. 39) mandible with preapical prominence bearing several small teeth (fig. 40). Body elongate, pronotum about 1.3 wider than long. Thorax and abdomen with gray spots on tergites. Dorsal setae moderately long (fig. 38) ..... *Sphindus* Dejean
– Antennomere II about 4 x as long as antennomere I (fig. 41). Mandible without prominence, bearing 5-6 preapical teeth (fig. 34). Body comparatively short and broad (fig. 32), pronotum 1.7 x

wider than long. Thorax and abdomen without spots on tergites. Body setae very long and conspicuous .... *Aspidiphorus* Sturm.

Acknowledgements

We thank the following individuals and institutions for lending or donating material to us: ANIC - Australian National Insect Collection (J.F. Lawrence); IZPAN - Institute of Zoology, PAS, Warszawa; MS - Musaeo National de Historia Natural, Santiago (A. Camousseight); MSNG - Museo Civico di Storia Naturale, Genova (R. Poggi). The illustrations in figs 1 and 17 were done by R. Dzwonkowski. Thanks are also given to R.A. Crowson, J.V. McHugh, J.F. Lawrence and Q.D. Wheeler for their help and advices during this study, and J.C. Luhman for his help with the English manuscript. Special thanks are given to John F. Lawrence for providing most of the material, including the generous gift of larvae of *P. chilensis* and *O. clavicornis*, and for critically reading the manuscript.

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SUMMARY

The sphindid genus *Protosphindus* Sen Gupta and Crowson is fully redescribed, and a second species of the genus, *P. bellus* sp. n. is described from Chile. Short diagnoses and a new key to known larvae of the World Sphindidae are provided. The larva of *P. chilensis* and the pupa of *Aspidiphorus orbiculatus* (Gyll.) are described for the first time.

RIASSUNTO

Il genere *Protosphindus* Sen Gupta e Crowson della famiglia Sphindidae viene totalmente ridescritto e una seconda specie del genere, *P. bellus* n. sp. è descritta del Cile. Sono fornite brevi diagnosi e una nuova chiave per riconoscere le larve di tutti gli Sfindidi. Per la prima volta vengono descritte la larva di *P. chilensis* e la pupa di *Aspidiphorus orbiculatus*.